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SWINE Production



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CONTENTS

	Page		Page
Hog-raising sections of the United States.....	1	Supplemental heat for pigs.....	23
Location of farm for hog raising ..	2	Heat lamps.....	24
Number of hogs for a farm.....	2	Pig hovers.....	24
Selection of breeding stock.....	2	Farrowing crate.....	26
The sows.....	2	Management of sows and suckling pigs.....	27
The boar.....	4	Anemia in suckling pigs.....	29
Feeds and feeding.....	5	Castration.....	29
Protein feeds.....	7	Weaning the pigs.....	29
Mineral mixtures.....	8	Two litters a year.....	30
Vitamins and antibiotics.....	9	Fall pigs.....	31
Water.....	9	Selecting pigs for breeding.....	31
Cooking and soaking feeds.....	10	The purebred hog business.....	32
Feeding the brood sow.....	10	Keeping records.....	32
Sows that eat their pigs.....	12	Selling breeding stock.....	33
The fattening stock.....	12	Sanitation.....	33
Growing and fattening rations.....	13	Shade.....	34
Feeder pigs.....	14	Hog wallows.....	34
Hog pastures.....	15	Diseases.....	35
Permanent pastures.....	16	Hog cholera.....	35
Temporary pastures.....	17	Swine erysipelas.....	36
Fences.....	18	Brucellosis.....	36
Management of the boar.....	18	Tuberculosis.....	37
Age for breeding sows.....	19	Necrotic enteritis.....	37
Management of sows during pregnancy.....	21	Parasites.....	38
Care of sows and pigs at farrowing.....	21	Internal parasites.....	38
		External parasites.....	38

SWINE PRODUCTION

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THE HOG is by far the most valuable farm animal in utilizing farm wastes and in converting the concentrates raised on the farm into a marketable product.

Farmers in various parts of the United States long ago recognized the merit of the hog as a money maker. Farmers in certain other parts of the country who heretofore have stuck to a one-crop system of farming are now looking to the possibilities of profits from hogs.

HOG-RAISING SECTIONS OF THE UNITED STATES

All regions of the United States are suitable for raising hogs. In practically every part of the country farmers can grow part or all the feeds used to grow and fatten hogs. The Corn Belt leads in hog production because it grows such an abundance of corn, the principal feed used in fattening hogs. In addition the Corn Belt grows alfalfa, undoubtedly the best pasture plant for hogs and the best relished hay crop. Many other pasture plants on which hogs do well also can be grown successfully in the Corn Belt.

It is a common mistake to think that hogs cannot be raised successfully in some parts of the country. Corn is not the only feed on which hogs will fatten. Also, hogs need a supplement to corn, containing considerable protein (muscle-building material). This protein supplement is usually fed in the form of tankage, fish meal, shorts or middlings, soybean meal, linseed meal, all of which must be purchased. These feeds may sell so high that farmers fail to buy them and so do not get the best results. Alfalfa contains a higher percentage of protein than other pasture plants in common use. Its protein makes alfalfa more valuable as a pasture and also as a hay for hog feeding.

Although the Corn Belt produces great quantities of pork products, particularly hams, bacon, and shoulders, that are consumed in other parts of the country, the South has abundant, year-round pastures—a distinct advantage in raising hogs. Cowpeas, soybeans, and peanuts are leguminous crops that can be grown successfully in many States.

In the West, especially in the irrigated valleys, barley and wheat grow in abundance. Both are used in fattening hogs. These western lands also produce good alfalfa, which makes hog growing a possible and profitable business. In recent years a considerable percentage of hogs slaughtered in the packing plants of the Mountain and Pacific Coast States are shipped from the western part of the Corn Belt. More of these hogs could be grown profitably in the Western States, nearer the slaughtering points.

¹ Revision of former editions by E. Z. Russell.

Many hog growers, particularly near large cities, feed garbage. Garbage-fed hogs do not gain so rapidly as corn-fed hogs, but they produce pork of equally good quality. Feeding garbage containing raw meat scraps or bones, however, favors the spread of trichinae among hogs. The danger of trichinosis in hogs may be eliminated by keeping separate garbage that contains raw meat scraps and bones. Thoroughly cook such scraps before feeding to hogs. Thus the garbage feeder saves the expense of cooking all the garbage, and the hogs have a chance to select the raw fruit and vegetable matter and still have a reasonably desirable feed.

LOCATION OF FARM FOR HOG RAISING

The feeds necessary to grow and fatten hogs should be given first consideration when the question of location of a farm for hog raising is being considered. Feeds can be produced more abundantly in some localities than in others. Other factors, such as markets and quality of soil, also should be studied. Sanitary conditions are more favorable where the land is rolling. If the farm is level and flat, it is advisable to throw up ridges with a scraper or road grader and to feed and house the hogs on these ridges. Good roads and accessibility to market are always to be considered.

NUMBER OF HOGS FOR A FARM

When beginning the hog business it is best to start with only a few sows. As the herd increases study carefully what crops the farm will produce most successfully and how hogs fit into the general plan for that particular farm. Study of these problems will soon indicate the most profitable number of brood sows. Then stick to this number of sows year after year. Taken alone market prices for hogs or for feeds used in fattening hogs should not be allowed to determine the number of sows to be bred at any breeding season. Prices for both hogs and feed may change very greatly before time to sell the next crop of pigs. The supply of available byproducts, such as skim milk, shattered grain from grain fields, unmarketable products from a truck farm, undigested grain in the droppings of fattening steers, and other wastes of feed should be taken into consideration when calculating the number of hogs to raise yearly.

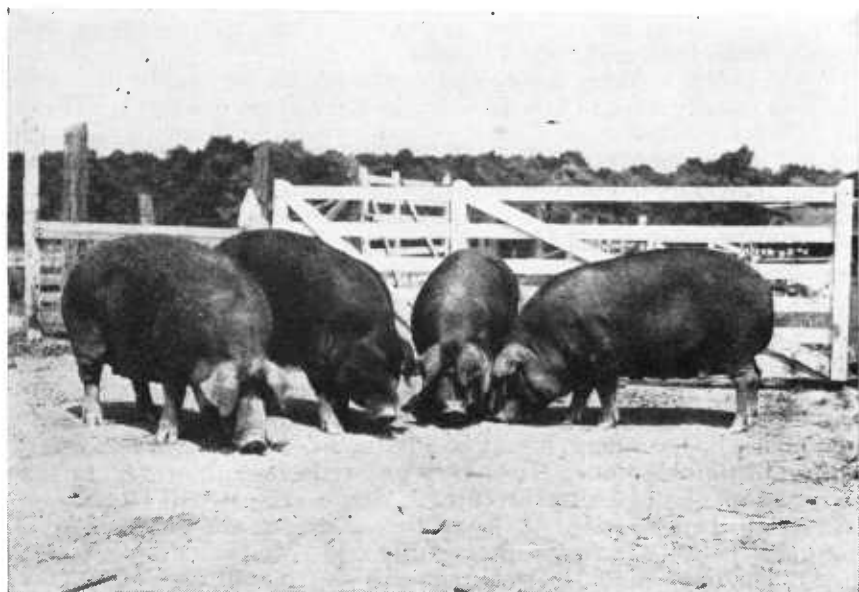
SELECTION OF BREEDING STOCK

It is desirable to use purebred animals in founding a herd. Too much valuable time and money are lost by starting with low-grade stock. Hogs multiply rapidly. So it is good business to make an initial investment in a few good purebred animals of the meat type as foundation stock. Saving the best of the gilts for a year or two will soon build the purebred sow herd to the number desirable for the farm.

THE SOWS

In choosing the foundation sows attention should be given to the type of animals to be used. Select sows of uniform type, of the same breed, similar in color, marking, and conformation. Sows of good type and conformation may be found in all the standard breeds. When buying foundation animals, it is generally advisable to buy sows

already bred. Tried sows or gilts may be used. Only too often a farmer fails to pay enough attention to the sows in the herd. Hog men are likely to depend too much on the boar to produce the quality and type of hogs desired. An old, experienced hog man once said, "Show me the sows in the herd and I'll tell you the kind of pigs that will be produced." There is a lot of truth in this statement. (Fig. 1.)



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FIGURE 1.—Quality as shown in a brood sow (left) and three of her produce.

First of all, the sow should show femininity. She should have a rather thin neck, good, clear eyes, ears of fair size, yet controlled so they will not cover the eyes and obstruct the sight, and a clean "sow" face, with good width between the eyes. She should be upstanding, with legs long enough so that the udder will not touch the ground when she matures. The back should be moderately arched, not too broad. She should have good, smooth, deep sides, and well-rounded hams. The udder should be well-developed and have two rows of teats, at least six in each row. Her legs should be strong and well-placed under the body, with good feet and short, strong pasterns. Particular attention should be given to the heart girth. The body should be full and smooth, with no depression showing behind the shoulders.

The disposition of the sow should receive careful attention. A good brood sow will permit the attendant to be in the pen with her at any time. A cross, nervous, or irritable sow is undesirable and should be eliminated from the herd as soon as practical. This trait may be hereditary, so it is advisable not to retain pigs from such a sow in the breeding herd.

Careful selection of sows raising good-sized litters of pigs that grow out well will soon establish a breeding herd of value. It is questionable management to use only gilts and fatten them for market after their first litter. The continuous use of immature breeding animals

may reduce the vitality and quality of the herd. It prevents also the building up of a good herd of producing sows which have been selected because of their ability to raise good litters of strong, thrifty pigs.

The function of a brood sow is to produce pigs at a profit. The cost of keeping a sow on the farm is the same regardless of the number of pigs she produces. If a sow raises eight pigs to the weaning age, she is more profitable than if she raises only five; therefore prolificacy is a very important essential in selection. Not only the sow to be placed in the herd, but the dam and granddam as well, should come from good-sized litters.

Uniformity in type, color, and conformation is highly desirable. So it is usually wise to buy foundation sows from one herd. Watch each litter. When pigs from any sow fail to conform to type and growth of the general herd, replace the sow with a gilt from a sow whose pigs show good type and feeding qualities. Careful selection and elimination of the least desirable breeders improve the herd, and in a few years enable the grower to market animals of uniform type and feeding qualities. Such command better price on the market.

THE BOAR

The selection of a boar is most important. If possible, everyone having breeding sows should have a boar, although when one has only three or four sows and arrangements can be made with some nearby neighbor who has a boar, it may be advisable not to make the necessary outlay to purchase one. It is very unsatisfactory, however, to take the sows off the place for breeding. Better success will be obtained in getting them "settled" if they can be mated on the place.

Study the sows in the herd carefully and note faults in conformation. The boar should be selected with the idea of correcting these faults as far as possible. It is undoubtedly true that "the boar is half the herd," but success cannot be obtained unless quality and type of both the sows and the boar are considered carefully, and herd quality improved by constructive mating.

Selection of the boar should be deferred until he is at least 6 months old. At that age a boar is so developed that serious faults may be seen. To tell the outcome of a suckling or weanling pig is practically impossible. It is always advisable in purchasing a boar to see the sire, the dam, and other animals in the herd which are closely related to the one under consideration.

It is better to buy a tried boar if one of the right type and conformation can be obtained at a reasonable price (fig. 2). If a tried boar is under consideration, the pigs he has sired should be carefully observed to see whether his particular qualities have been transmitted. A boar with good conformation is not always a good sire.

A boar used as a sire should not be discarded until the growing and feeding qualities of his get are determined by a test in the feed lot. Sires of superior quality are not numerous. When the practice is followed of using a boar one season and then marketing him, many a valuable sire may be sent to the block that should have been retained for breeding.

A boar should not be used before he is 8 months of age. If he proves a superior sire he should be retained as a breeder. However, if his continued use results in too much inbreeding, he should be sold, or traded, for another boar of similar quality.

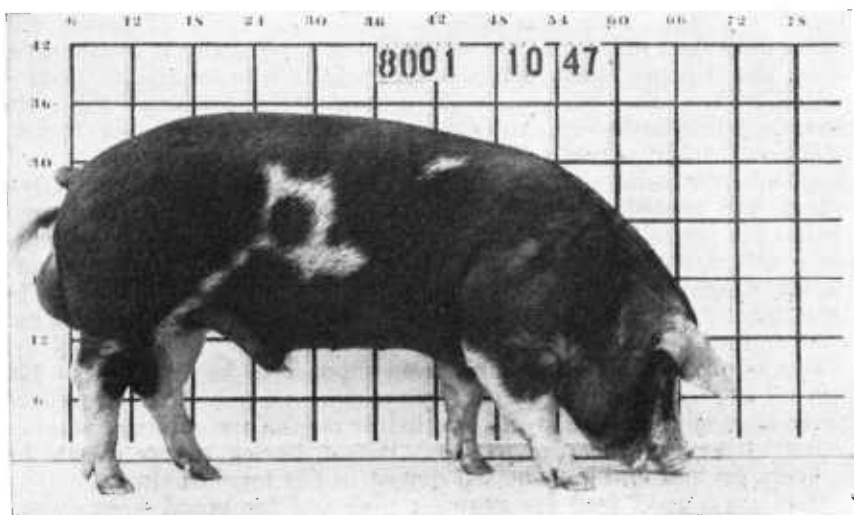


FIGURE 2.—Boar of a desirable type.

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A herd boar must be handled frequently; consequently his disposition is important. A cross, irritable boar, difficult to drive or inclined to fight, should not be kept unless he has some extraordinary qualities that are urgently needed in the herd.

The boar must show masculinity. This is characterized by a strong, wide head, a short, thick, well-crested neck, well-developed shoulders, a strong, well-arched back, well-sprung ribs, and a good covering of flesh. The hair of the boar is commonly coarser than that of the sow. His hams should be round and full, his sides even and smooth. Wrinkles or creases in the sides and shoulders are very objectionable. When standing at some distance in front of a boar one should easily be able to distinguish him from a sow. He should by all means have strong feet and legs. The bone should be of good quality and of sufficient size to carry easily any weight that he may attain. Particular attention should be given to the pasterns, which should be short and straight. His reproductive organs should be clearly visible and well-developed. A boar with only one testicle should never be selected.

Rupture is a weakness to be guarded against and the selection of either a boar or sow from a litter in which an animal of either sex is ruptured, is not recommended. A deficiency in the heart girth is probably a constitutional weakness, and animals having a pronounced defect of this kind should not be retained.

FEEDS AND FEEDING

Corn is the principal grain feed for hogs but because of its deficiency in protein it must be supplemented with some feed high in protein. Other feeds available to the American hog producer, that may be substituted to a greater or less extent for corn, are wheat, barley, rye, and oats.

Corn should be fed on the cob or shelled. Grinding it for hogs does not pay. Feeding trials show that yellow corn is superior to white corn when fed to pigs up to about 100 pounds' weight, when they are

fed in dry lot. This difference in the feeding value of yellow and white corn does not appear when good legume pasture is available or when about 5 percent of good, leafy, alfalfa hay or alfalfa meal is added to a white-corn ration. For hogs weighing more than 100 pounds, white corn seems to be equal to yellow corn, even in dry lot.

Wheat usually gives somewhat better feeding results than corn. Experiments show that its feeding value varies considerably, but wheat will probably give about 5 percent better results than corn, pound for pound. The relative value of barley and corn depends to some extent on the weight, per bushel, of the barley. Good, sound barley weighing 46 or more pounds per bushel is considered to be from 90 to 95 percent as good as corn. Barley of lighter weight has a lower feeding value.

Rye is often fed to hogs and tests show it to be from 95 to 100 percent as good as corn. Generally rye does not seem to be so palatable to hogs as the other grains and better results are obtained when it is fed with corn, wheat, or barley. Wheat, barley, or rye should be coarsely ground and may be fed dry or in the form of slop.

Oats are a good feed for growing pigs and for brood sows. Oats contain too much fiber and are too bulky to be satisfactory for fattening hogs, although they may be used in addition to corn, wheat, or barley. As compared to corn, oats of standard weight are about 60 to 70 percent as efficient. Lightweight oats should not be fed, because they are too bulky. It is usually best to feed oats ground or rolled, but feeding in self-feeders or scattered thinly on a feeding floor will prove satisfactory.

Kafir, milo, and feterita are good hog feeds, much the same as corn, though not quite so high in fat. These grains may be fed in the head or if threshed, may be supplied whole or ground. Experiments show them to be from 90 to 100 percent as good as corn.

Soybeans are a rich protein feed, and should be fed only when supplemented by corn or some other carbohydrate. When soybeans are fed alone satisfactory gains will not be made, and if fed alone for any considerable time the hog carcasses will not be firm. Experiments conducted by State and Federal investigators, using more than 800 hogs in hogging down corn and soybeans, with and without a mineral supplement, failed to produce uniformly hard or soft carcasses. About half the carcasses graded soft and about half, hard. It is largely a question of the preference of the individual hog for either of these feeds. Some hogs seem to like soybeans, while others do not, and some varieties of beans seem to be much more palatable than others.

Peanuts are grown in many sections of the South and are a good feed for fattening hogs. If peanuts are fed in any great quantity the pork will be soft or oily. Although peanuts have a relatively high percentage of protein, the addition of tankage has produced much more rapid and economical gains.

Hominy feed is sometimes fed to hogs and has proved to be a good feed, but its efficiency is from 3 to 7 percent less than corn.

Potatoes should be cooked when fed to hogs and then about 4½ pounds are necessary to equal 1 pound of corn. Potatoes should be mixed with ground corn, using not more than 4 pounds of potatoes to 1 of corn.

Any of these feeds should be supplemented with some feed high in protein listed under Protein Feeds.

Molasses is not used much as a feed for hogs and if fed should be mixed with concentrates. Only a few experiments have been made with this feed for hogs and they show wide variations in results, some as low as about 60 percent of the feeding value of corn.

Root crops are usually relished by hogs and are desirable but cannot be considered an economical feed. Good alfalfa pasture or alfalfa hay is usually more efficient.

Silage, as such, is practically of no value for hogs. When made of standing corn, the feeding value is in direct proportion to the grain in the silage.

Proso or hog millet is raised to some extent in the Western and Northern Plain States and is a good feed for hogs. It is carbonaceous and should be ground and fed with a protein supplement.

When suggestions made here for feeding have been followed, either soaking or wetting the feeds is not necessary, except in the case of corn that is especially hard or flinty.

Regardless of the kind or quantity of feed given to hogs, no abrupt changes should be made. Any desirable change of feed should be made gradually by substituting probably not over 25 percent of the new feed for the old and taking at least a week to complete the change.

PROTEIN FEEDS

Any of the feeds referred to thus far must be supplemented with a good protein feed. The ordinary 60 percent packing-house tankage is the feed most commonly used for this purpose. Experiments have shown that fish meal is equal in value to tankage, and mixture of either tankage or fish meal 2 parts, linseed meal, cottonseed meal, or alfalfa meal 1 part each, have proved satisfactory. Some experiments with 1 part of tankage or fish meal and 1 part of either linseed or cottonseed meal have given good results. Soybean meal is also used as part of a protein mixture.

Young growing pigs and also sows during gestation require a greater percentage of protein to corn than do fattening hogs. As pigs become heavier and fatter, less protein is required.

Both linseed meal and cottonseed meal are fed to hogs as protein feeds, but the best results are obtained when they are mixed with tankage or fish meal, as suggested. Cottonseed meal may have a harmful effect on hogs if fed in too great a proportion, especially in the absence of adequate supplements, such as vitamins A and D, phosphorus and calcium.

Middlings and shorts are commonly used in hog feeding, generally for sows and pigs during suckling. However, experiments by the United States Department of Agriculture showed that better results were obtained by feeding sows and pigs, during suckling, on corn and tankage than on corn, tankage, and middlings, or on corn and middlings.

Wheat bran is used as a hog feed to a limited extent, but it is too bulky and probably no more valuable than good clover or alfalfa hay.

Skim milk is a valuable protein supplement for grain, but should not be used as a whole ration. A general rule is that 100 pounds of skim milk will replace about 9 pounds of tankage. Skim milk is regarded by some men as being indispensable, but this is not actually the case. In dairy districts, however, this and other milk products form an important part of the hog's ration, and are recommended whenever they may be obtained at a suitable price.

The best results are obtained from skim milk when it is fed with corn or other fattening feeds, and then in limited quantities, as follows: For pigs just weaned, about 4 or 5 pounds of skim milk to 1 pound of corn; for pigs weighing from 50 to 100 pounds, about 2 to 3 pounds to 1 of corn; for pigs 100 to 150 pounds, about 2½ pounds to 1 of corn. Larger hogs need from 1 to 2 pounds to 1 of corn. From a money-value standpoint 100 pounds of skim milk is worth about as much as one-half bushel of shelled corn.

When the skim milk is from cows that have not been tested and found to be free from tuberculosis, it should be heated to boiling before being fed to hogs, as this disease can easily be transmitted to hogs in this manner.

Do not feed poultry offal to hogs unless it is cooked sufficiently to avoid any danger from avian tuberculosis.

Buttermilk that has not been diluted has about the same value as skim milk for hogs. Both semisolid and dried buttermilk are good protein feeds for hogs, but ordinarily the price is too high for either product to be fed economically. Semisolid buttermilk should be diluted with water to about the consistence of ordinary buttermilk. The dried product fed alone in powdered form is mixed with other feeds.

Whey has proved to be a good protein supplement to corn or barley, but a protein of a vegetable nature such as linseed meal, soybean meal, cottonseed meal, or middlings should be added. Whey has produced better results with barley than with corn. Whey is worth about half as much as skim milk when fed in this way.

MINERAL MIXTURES

Inorganic or mineral substances in the diet of hogs are just as necessary for good nutrition as are the organic compounds (protein, fat, and carbohydrates). Common salt (sodium chloride) is required in the ration, since it enters into the composition of all the tissues and secretions of the body. Other salts, especially those of calcium and phosphorus, are needed in the growing animal and are required by sows during the gestation period for the proper nourishment of fetuses, and later during the suckling period because of their favorable influence on lactation. Smaller quantities of iron with traces of copper are required for blood formation.

Plants contain small quantities of combinations of sodium, potassium, calcium, magnesium, phosphorus, iron, sulfur, and iodine. Cereal grains, however, have some of these elements in quantities too small to supply the bodily requirements for nutrition and growth. It is necessary, therefore, to supplement the supply from plants with mineral substances from other sources, particularly calcium and phosphorus, and, in some areas, iodine.

The leaves and stems of plants have a greater percentage of minerals, including calcium, than the seeds. Pasture-fed pigs, therefore, require less supplemental mineral feed than pigs in dry lots.

Many combinations of mineral substances have been suggested. Any combination which contains enough lime and phosphoric acid and is palatable enough to be eaten freely will be satisfactory. A mixture of equal weights of steamed bonemeal, ground limestone or air-slaked lime, and common salt is palatable and contains the elements for supplementing the grain feeds. Such a mixture may be fed to

pigs on pasture or in the dry lot. In sections where there is danger of goiter it is advisable to use iodized salt in the mineral mixture.

Wood ashes are often available and may be incorporated in the mineral mixture to advantage. When added to the mixture just mentioned, they may be used up to one-third of the weight of the mixture.

A mineral mixture should be supplied to hogs in boxes or self-feeders where it will be dry and available at all times.

Charcoal is often used in mixtures and is superior to soft coal. Neither charcoal nor coal has much food value, but both appear to be highly palatable to pigs.

VITAMINS AND ANTIBIOTICS

Of the various vitamins, vitamins A and D, thiamine, riboflavin, niacin, pantothenic acid, pyridoxin, and vitamin B₁₂ are known to be required by swine. With the exception of vitamin D, these requirements will usually be covered adequately by an otherwise satisfactory feed mixture containing alfalfa as a source of vitamin A and some source of vitamin B₁₂ such as fishmeal, tankage, or fermentation residues. The requirement for vitamin D may be met by adding to the diet small quantities of A and D feeding oil or irradiated yeast, or by exposing the pigs to sunlight. Placing the pigs on green pasture, with the attendant exposure to sunlight, is good insurance against deficiency of any of these vitamins with the possible exception of vitamin B₁₂.

More recently reports from various quarters have indicated that young pigs receiving small supplements of antibiotics with their feed have shown improved performance over comparable animals receiving the same ration without antibiotics. In other cases improvement was not observed. Although opinions differ regarding the mode of action of the antibiotics and their exact sphere of usefulness, there is no longer any question that their use is frequently beneficial. This seems to be particularly true of less thrifty pigs reared under less desirable conditions of sanitation or on rations that provide a limited supply of vitamins.

While the matter remains in the experimental stage, it seems that the only sure way for a grower to discover the effect of an antibiotic in a particular case is to make a practical test of its effect on his own farm. He should follow the directions of the manufacturer of the product he tests. The antibiotics are effective in such extremely small quantities that home mixing is not likely to be practical. Mixed feeds to which antibiotics have been added are available commercially.

Aureomycin, streptomycin, terramycin, bacitracin, and penicillin are some of the antibiotics from which favorable results have been reported. The products used in swine feeding represent the dried residues remaining after most of the antibiotic drug has been removed from the fermented mash for use in medicine.

WATER

An important matter often neglected is the water supply. Many hogs get water only twice a day when the herdsman pours a quantity into a foul, dirty trough. This system is plain bad management and should be avoided. Every place where hogs are kept should have running water or an automatic supply system that furnishes clean water whenever the hogs want it.

COOKING AND SOAKING FEEDS

Earlier it was generally believed that practically all feeds for hogs would be made better by cooking, but tests at many of the State agricultural experiment stations show conclusively that cooking any of the ordinary grains used in hog feeding is more harmful than beneficial. The time and fuel used in cooking is worse than wasted.

FEEDING THE BROOD SOW

Rations for brood sows include grain and a protein-mineral supplement. During the gestation period and for about 10 days after farrowing, the mixture is fed by hand. During the remainder of the suckling period, it is supplied in a self-feeder. The grain part of the ration may be varied according to availability of farm grains such as yellow corn, barley, oats, etc. A formula for the gestation and another for the suckling period are as follows:

	<i>Gestation period (Pounds)</i>	<i>Suckling period (Pounds)</i>
Ingredient:		
Ground yellow corn.....	1, 100	900
Coarsely ground or rolled oats.....	300	300
Standard middlings.....		350
60-percent tankage or meat scraps.....	75	75
High-grade fish meal.....	75	75
Soybean meal.....	75	150
Linseed meal.....	50	
Alfalfa meal.....	300	100
Mineral mixture.....	25	50
Total.....	2, 000	2, 000

The mineral mixture to feed with each formula is composed of the following:

	<i>Gestation period Pounds</i>	<i>Suckling period Pounds</i>
Ingredient:		
Ground limestone.....	35	35
Steamed bonemeal.....	35	35
Iodized salt.....	30	30
Ferrous sulfate.....	2	2
Glauber's salt.....	23	
Total.....	125	102

The gestation ration may be mixed in definite proportions and hand-fed in a trough at the rate of $1\frac{1}{2}$ pounds daily for each 100 pounds of live weight of sow, or 2 pounds daily for each 100 pounds live weight of gilt. This would be $4\frac{1}{2}$ pounds a day for a 300-pound sow and 5 pounds of feed a day for a 250-pound gilt.

Another method is to scatter a daily feed of shelled corn (ear corn may be used if desired) in the field to encourage the sow to exercise. In this way a sow can seldom pick up two grains at one time and will get tired before she eats more than she needs. Mix the ground oats, protein and mineral supplements in definite proportions and feed the daily ration in a trough to avoid waste in snow or mud. If this part of the ration is fed dry the sow may be forced to exercise by walking some distance from the trough to obtain water. An alfalfa rack (fig. 3) is in the field where the sows can get good, bright, leafy

alfalfa hay when they want it. This plan gives the sow a ration containing about 15 percent protein, which is believed to be about right. A sow must have a higher percentage of protein during gestation than a fattening hog.

Bring the sow on feed gradually after farrowing, so that she is getting a full ration when pigs are a week to 10 days of age. Then supply the mixture in a self-feeder and provide a pasture. If possible, the new quarters should be where no hogs have been during the previous year or on ground that has been plowed since hogs were there.

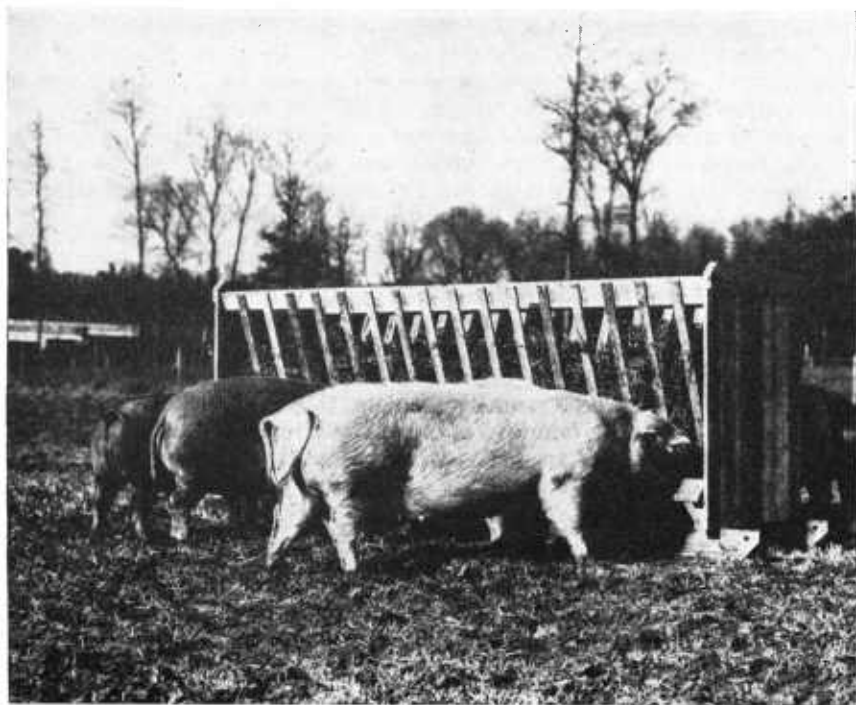


FIGURE 3.—Alfalfa hay in rack for brood sows.

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During the suckling period the ration may be mixed in definite proportions and self-fed to the sow and her litter when they are on good quality pasture. Water should be supplied from an automatic waterer, attached to the water-supply pipeline, or from a running stream.

It sometimes happens that when the sow farrows she will not have any milk. When such cases occur the newly farrowed pigs should be fed cow's milk, undiluted, in small quantities at about 2-hour intervals. This milk may be fed with a nipple or by pouring a small quantity, not more than half an inch in depth, into the bottom of a thoroughly cleaned shallow tin pan. The pigs will rub their noses in the milk and soon begin to drink. Care must be taken not to over-feed them, especially when they are only a few days old.

Milk substitutes, sometimes referred to as synthetic milk, are available commercially. It may be wise to have a small supply on hand for use in the diet of orphan pigs. Milk substitutes may also be used to advantage in the creep ration to get small pigs off to a fast start.

Twenty-four hours before she farrows, reduce the richness and quantity of the sow's feed by at least half. She should have no feed during the first 24 hours after farrowing, but because of her feverish condition she should have plenty of lukewarm water at frequent intervals.

After 24 hours the sow should be allowed a small feed of a light slop of shorts or middlings, and the same feeds she has had during pregnancy should be continued. The pigs should be closely examined before each feeding of the sow until they are about 10 days old for any appearance of white scours or diarrhea. If this trouble appears, discontinue feeding the slop and give the sow a small quantity of oats, scattered thinly on the floor. Prepare limewater by dissolving a piece of rock lime about the size of a baseball in a gallon of water; after it settles drain off the water and give it to the sow to drink; also bathe the sow's udder and teats with some of the limewater. The pigs which are scouring should be given five drops of diluted formalin (on the tongue), prepared by mixing 1 ounce of standard-strength formalin and 1 pint of water.

SOWS THAT EAT THEIR PIGS

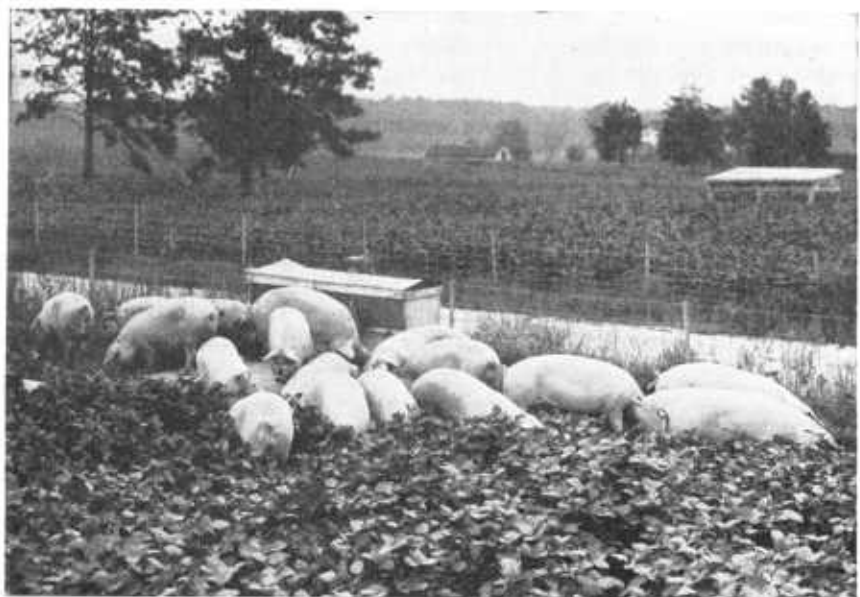
It is not natural for a sow to eat her pigs. This abnormal appetite may result from any of several causes. It usually shows she has not been properly fed and cared for during pregnancy. Plenty of exercise and feeds such as are described under "Management of Sows During Pregnancy" will usually prevent this trouble at farrowing. Care should always be taken to see that the bowels are in good condition. If they are not, feed a sufficient quantity (about 1 pint) of linseed meal or supply a handful of Glauber's salt dissolved in the drinking water or slop.

THE FATTENING STOCK

After weaning, most farmers follow one of two plans for getting hogs ready for market: (1) Keep them on a good growing ration until 60 to 75 days before market time and then put them on full feed of grain and a protein feed. (2) Keep them on full feed all the time until they go to market.

The better plan to follow may depend somewhat on market conditions, but the decision is more likely to be made on the farm situation and how hog feeding fits into the general farm plan. In either case the pig should not be fed so sparingly that it fails to gain. The cost for each pound of gain must be considered. This in turn depends on the supply, price, and convenience of marketing grain. If the farmer has plenty of corn, wheat, or barley, the full-feeding plan may be a welcome way of getting a good price for the grain without the work of hauling it to market.

If the plan of growing first and fattening later is chosen, from 1 to 2 pounds of grain for each hog makes a good supplement to abundant pasture. Corn or ground barley are the best grain feeds. For the fattening period, leave the hogs on good pasture if possible and let them have all the corn or barley they will eat with a protein supplement added. Whether hand fed or from a self-feeder (fig. 4) the grain and supplement should be fed separately. Individual appetites vary, and separate feeding gives each hog a chance to choose his feed. If the two kinds of feed are mixed some hogs may not eat their fill because they balk at one of the feeds in the combination.



69953B

FIGURE 4.—Self-feeders reduce labor costs in fattening hogs.

GROWING AND FATTENING RATIOS

The following mixed feeds may be fed to growing pigs from the time they are weaned at about 56 days of age until they reach market weight of approximately 225 pounds.

Protein-mineral mixture

Ingredient:	Parts	Ingredient—Continued	Parts
Tankage-----	10	Linseed meal-----	20
Fishmeal-----	10	Alfalfa meal-----	20
Soybean meal-----	35	Mineral mixture-----	5
			<hr/>
			100

This mineral mixture is composed of the following:

Ingredient:	Parts	Ingredient—Continued	Parts
Iodized salt-----	20.0	Ferrous (iron) sulfate-----	2.0
Steamed bonemeal-----	20.0	Copper sulfate-----	0.1
Pulverized limestone-----	57.7	Manganese sulfate-----	0.2

The proportion of ingredients fed to pigs after weaning should change as the pigs advance in age and weight. The proportions might be as follows:

Age of pigs Weeks	Approximate weight of pigs Pounds	Corn Parts	Protein- mineral mixture Parts
8 to 14-----	90	70	30
14 to 20-----	160	75	25
20 to 25-----	225	83	17

In full feeding from weaning to market, the most economical way is likely to be to have the pigs on good pasture with free access to one or more of the grains and a protein feed, each in a self-feeder.

How much feed is needed to put 100 pounds of gain on a hog is of great interest to the feeder. No exact quantity can be named. Much depends on the quality of the breeding stock, on the quality of grain and pasture, on the weather, and on the skill of the feeder. If good well-bred pigs are full fed from weaning to market a skillful feeder is likely to get 100 pounds gain in live weight from 300 to 350 pounds of corn plus 25 to 35 pounds of tankage or protein supplement. If pigs are started on feed at a heavier weight, say 75 pounds or more, the feed cost for 100 pounds of gain is likely to be somewhat greater.

A successful and economical plan of fattening hogs is to "hog down" the corn, also letting the hogs have access to a good pasture of alfalfa, Ladino, or red clover, and a protein feed in a self-feeder. The hogs will harvest all the corn in this way and in addition will help build up the fertility of the soil. (Fig. 5.)



78935B

FIGURE 5.—"Hogging down," an economical way to harvest the corn crop.

Under this plan of feeding, free access to good pure water and a mineral mixture containing salt is necessary at all times.

Over a period of years, hogs weighing from 190 to 225 pounds commanded a better price, at least three-fourths of the time, than hogs of lighter or heavier weights. It is impossible to say when hogs should be marketed, but a safe plan is to sell when they are at a market weight which commands the best price at the time. No one can foretell future prices; consequently if the producer holds fat hogs for a higher market, he may be sadly disappointed.

FEEDER PIGS

There has been an increasing demand for feeder pigs, or pigs weighing from 75 to 100 pounds, in some cases up to 120 pounds. This demand comes largely from farmers in the Corn Belt and from men in the business of fattening pigs. Other demands for feeder pigs come from garbage-feeding and serum plants.

Irrigated valleys of the West supply alfalfa in abundance. Southern areas grow various good pasture crops for hogs, such as lespedeza, winter oats, rye, wheat, carpet grass, and Bermuda grass. In some of these sections a feed crop to fatten hogs is uncertain but a farmer is likely to grow grain enough to use it economically as a supplement to pasture. This can make profitable the production of feeder pigs. In view of the demand for feeder pigs at all seasons of the year, the production of these pigs calls for consideration in localities where fattening crops are uncertain. (Fig. 6.)

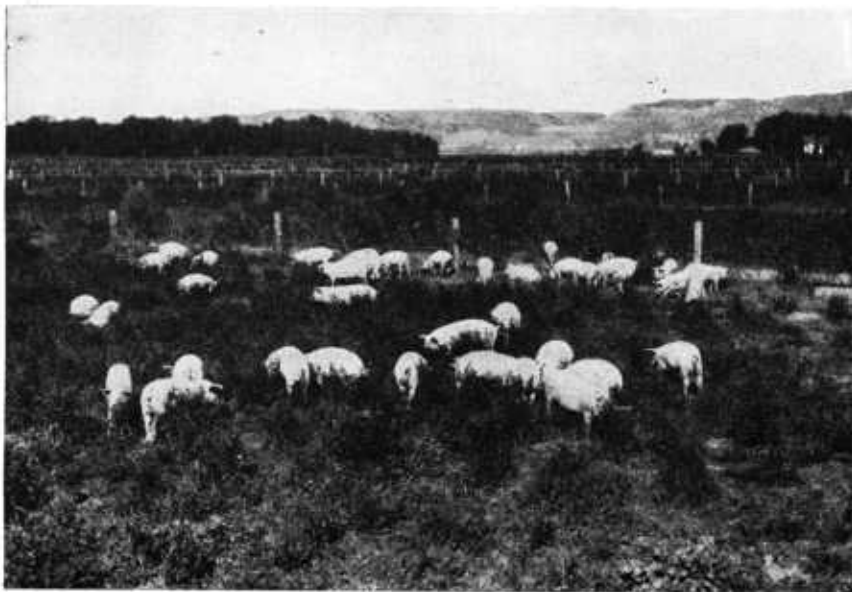


FIGURE 6.—Feeder pigs on alfalfa pasture.

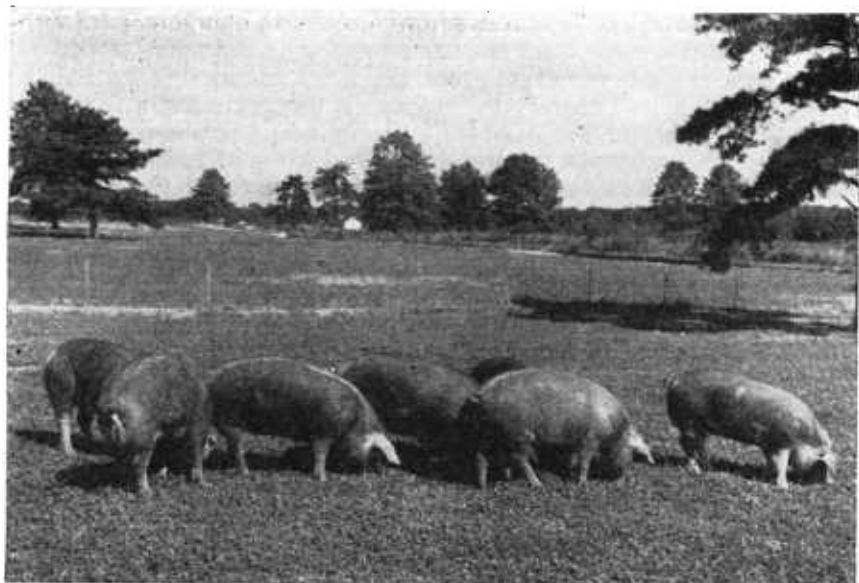
37069B

Twelve experiments have been conducted at the United States experiment stations in South Dakota and Montana in the production of feeder pigs. When the pigs received $1\frac{1}{2}$ pounds of corn a head daily, without any protein supplement except alfalfa pasture, the range in the quantity of corn needed to produce 100 pounds of gain was from 230 to 300 pounds, averaging about 264. The pigs made an average daily gain of 0.57 pound. These pigs were fed from weaning time to a weight of approximately 100 pounds. A few experiments in which 1 pound of corn per pig was fed daily showed a smaller feed consumption and a slower gain, while 2 pounds per pig daily resulted in more rapid gains at a higher cost.

HOG PASTURES

Pastures for hogs are valuable and should be utilized fully. The best use of pastures, however, does not mean that hogs fatten or even make satisfactory growth on pasture alone. For best results, pastures of any kind, regardless of quality, must be supplemented with grain and a mineral mixture.

The hog grower should never attempt to supply only "just enough" pasture. (Fig. 7.) Pastures will not produce the best results if they



12893A

FIGURE 7.—A breeding herd on Ladino pasture.

are grazed close. Only as many hogs as can be provided with an abundance of feed should be placed in any lot or pasture. How many animals may be grazed on an acre depends on the crop, the quality of the soil, and climatic conditions. Ordinarily an acre will pasture from 5 to 15 hogs averaging 100 pounds. A good plan is to have two pastures for each lot of hogs. By alternating, each pasture may be grazed fairly close and still provide good, succulent feed. Pasture crops allowed to mature do not furnish good feed for hogs. Plan new plantings to replace maturing pasture crops.

The fertilizer value of the manure which hogs leave on the land is an indirect and generally unnoticed value. It should be taken into account when hog pastures are being considered. Hogs on pasture range all over the enclosure; consequently the distribution of the manure is quite uniform. Furthermore, very little of it is lost. This value to be derived from pasturing of hogs is not limited to any particular locality or section of the country. Any differences in value trace to lengths of the pasture seasons.

The value of good pastures to breeding animals cannot be overestimated. For efficiency the breeding sow and boar must have exercise and a variety of feeds. In no other way can exercise and a variety of feeds be supplied as well as by giving the animals free range on good pasture.

PERMANENT PASTURES

In most hog-growing sections farmers plan to keep hogs mainly on permanent pastures but the grasses common in permanent pastures are not useful in small lots or in inclosures where there are hogs enough to keep the pasture grazed close. Such lots should be handled as temporary pastures and plowed frequently. Plowing once a year—or better twice a year—does not allow time for the permanent pasture plants to get established.

Many successful hog growers place on permanent pasture only a limited number of hogs, few enough so that the pasture makes growth enough to produce a crop of hay. Plants more generally used for permanent pastures are alfalfa, Ladino, red clover, alsike, white clover, bluegrass, bur clover, Bermuda grass, lespedeza, carpet grass, crabgrass, and Dallis grass. The first six are used in the northern half of the United States. Bluegrass and white clover are commonly grown together. Timothy is often grown with red clover. The other plants are grown in the southern parts of the country. All the plants grown in the North are to a greater or lesser extent grown also in the South. Of all the permanent pasture plants alfalfa and Ladino undoubtedly head the list for hogs. In localities where these plants thrive no other permanent pasture is necessary.

TEMPORARY PASTURES

Nearly every hog farm has temporary pastures. These are valuable as a supplement to permanent pastures or on farms where there are no permanent pastures. Every barnyard and small lot where hogs are kept should be plowed and seeded at least once a year. These lots are usually well-fertilized and produce abundantly.

The most common temporary pastures are rye, oats, wheat, rape, soybeans, and cowpeas. These various pasture plants are grown in practically all parts of the United States. Seeding for temporary pastures should be much heavier than for a grain crop. Rye may be sown in the fall from the 1st of September to December, depending on the locality. (Fig. 8.) In the northern parts of the country it may be grazed until covered by snow or made worthless by freezing. It comes early in the spring and may be grazed until May. If the growth is very rank, it is sometimes advisable to clip it with a mowing machine, setting the cutting bar as high as possible. In the South it may



FIGURE 8.—Sows and pigs on rye and Italian rye grass.

68896B

produce good grazing all winter. Winter wheat can be handled in much the same way. In sections where winter oats are grown the crop can be pastured much the same as rye. In the North oats sown in the spring make a good pasture while they last, but the pasture period is short. Rape is often sown with oats in the spring; Dwarf Essex is the variety. This crop may be seeded from early spring until summer. When plants are from 6 to 10 inches high the crop may be grazed quite heavily. It will keep growing and produce good, succulent feed if the season is right. Seed from 4 to 6 pounds to the acre.

Cowpeas and soybeans are sown in the spring and are sometimes planted together. Of the two, soybeans will usually make the best hog pasture. A variety producing a large quantity of foliage should be selected with preference to a variety that does well in the locality. Turn in the hogs when the plants are 6 to 8 inches high and if there are hogs enough in the pasture to eat it down, take them out for a while to permit the plants to grow up again.

Dallis grass is a perennial and sweetclover is biennial; the former is grown in the South and the latter in nearly all sections. Both make satisfactory pastures for hogs. Dallis grass grows well in low, moist lands, makes a good growth in warm weather, and withstands close grazing remarkably well. Sweetclover grows rapidly in good soils and should be grazed heavily to keep the plants from becoming tough and fibrous.

FENCES

If pastures are to be fully utilized the various fields and lots must be fenced "hog tight." Most farmers use woven-wire fencing. On 10-acre or larger fields, it is best to use a fence 26 inches in height, and to place one strand of barbed wire at the bottom of the woven fencing just above the ground. It is easier to keep hogs in large enclosures than in small ones; consequently if an enclosure is small a higher fence is likely to be necessary, say 32 or 36 inches.

For a woven-wire fence it is essential to have good, well-braced corner posts. Probably 90 percent of the effectiveness of a woven-wire fence depends on the setting and bracing of the corner posts making it possible to stretch the wire taut. An animal will soon locate a weak spot in the fence. No matter how taut the fence is at first it cannot remain that way if the corner posts give in the least. When a temporary fence around a small area is needed, it may be made by using 6-inch fence boards, made into panels, and attaching them to temporary posts or stakes, driven into the ground, or by using 26-inch woven-wire fencing which may be unrolled and again rolled after using. The latter method, however, is not very satisfactory, as it is not easy to roll woven wire in the feedlot.

MANAGEMENT OF THE BOAR

During the breeding season the management of the boar calls for the careful attention of the herdsman. For breeding, all the sows should be taken to an enclosure, preferably under cover, in which a breeding crate is placed. A boar well-handled soon becomes accustomed to a breeding crate and more successful services will result. He should never be allowed to run with the sows during the breeding season. He should not be confined to a small pen, but should have the run of a good-size lot or pasture. The boar lot should be convenient

to the breeding pen but should not be adjacent to lots in which breeding sows or other hogs are kept. During the breeding season the boar should be undisturbed as much of the time as possible.

One service to each sow is sufficient. A young boar should not be allowed to serve more than one sow each 24 hours. It is best for an aged boar not to serve more than one sow a day, but if necessary a strong, vigorous, mature boar may serve two sows in a day, breeding one early in the morning and the other late in the evening.

The boar's feed during the breeding season should be abundant and of good quality, in fact all he will clean up twice daily. It is advisable to feed corn in addition to a thick slop of middlings or shorts, to which may be added a small quantity of tankage, fish meal, or linseed meal. When pasture is not available, alfalfa hay of good quality should be supplied in a rack. Salt and mineral mixture should also be provided.

If a boar becomes restless and gets to "ranting," the trouble may sometimes be overcome by placing a bred sow in the lot with him. Occasionally during the breeding season a boar goes off his feed. If this occurs, put a young boar pig in his lot. The boar frequently will eat the feed offered to keep the pig from getting it.

After the breeding season is over the feed of the boar should be reduced so that he will just keep in a good, thrifty condition. Only a small quantity of corn should be fed at this time, his main feed being middlings or shorts, oats, or a little linseed meal, with the run of a good pasture.

AGE FOR BREEDING SOWS

The age at which a gilt should be bred to produce her first litter may depend somewhat on her development. If the breeder is to get the best results he should select only growthy, well-developed young sows. A well-developed young sow can be bred safely when she is 8 months old, but it is not advisable to breed her before that time. Sows bred too young seldom produce as they should, frequently have trouble at farrowing time, and do not make the best growth after weaning their first litters.

It is advisable not to breed a sow to farrow in the fall after she weans her first litter in the spring at an age of about 12 months. She should have the time between weaning her spring litter and being bred in the fall, for growth and development. After she is 2 years old, however, she is fully capable of producing two litters a year.

A brood sow that produces a good-sized litter that is profitable in the feed lot or breeding herd should be retained as long as her usefulness continues. This is often from 6 to 8 years, sometimes longer. An instance is known of a sow that produced a good litter at the age of 14 years.

A sow will usually farrow in from 112 to 115 days after the day she is bred. In some instances she will farrow in 110 or 111 days and sometimes she may go a few days over 115. By keeping a careful service record, the breeder will be able to determine quite accurately when to expect the pigs and to make his arrangements accordingly. The gestation table on page 20 is based on a period of 112 days. The first column indicates breeding dates and directly opposite is the date on which the sow is due to farrow.

Calendar showing dates of breeding and farrowing for sows, based on 112-day gestation period

Date bred	Jan. 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Date due	Apr. 23	24	25	26	27	28	29	30	31	May 1	2	3	4	5	6	7	8	9	10	11	12	13	14
Date bred	Feb. 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Date due	May 24	25	26	27	28	29	30	31	June 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Date bred	Mar. 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Date due	June 24	25	26	27	28	29	30	31	July 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Date bred	Apr. 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Date due	July 22	23	24	25	26	27	28	29	30	31	Aug. 1	2	3	4	5	6	7	8	9	10	11	12	13
Date bred	May 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Date due	Aug. 22	23	24	25	26	27	28	29	30	31	Sept. 1	2	3	4	5	6	7	8	9	10	11	12	13
Date bred	June 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Date due	Sept. 21	22	23	24	25	26	27	28	29	30	Oct. 1	2	3	4	5	6	7	8	9	10	11	12	13
Date bred	July 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Date due	Oct. 21	22	23	24	25	26	27	28	29	30	31	Nov. 1	2	3	4	5	6	7	8	9	10	11	12
Date bred	Aug. 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Date due	Nov. 21	22	23	24	25	26	27	28	29	30	Dec. 1	2	3	4	5	6	7	8	9	10	11	12	13
Date bred	Sept. 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Date due	Dec. 22	23	24	25	26	27	28	29	30	31	Jan. 1	2	3	4	5	6	7	8	9	10	11	12	13
Date bred	Oct. 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Date due	Jan. 21	22	23	24	25	26	27	28	29	30	31	Feb. 1	2	3	4	5	6	7	8	9	10	11	12
Date bred	Nov. 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Date due	Mar. 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Date bred	Dec. 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Date due	Apr. 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23

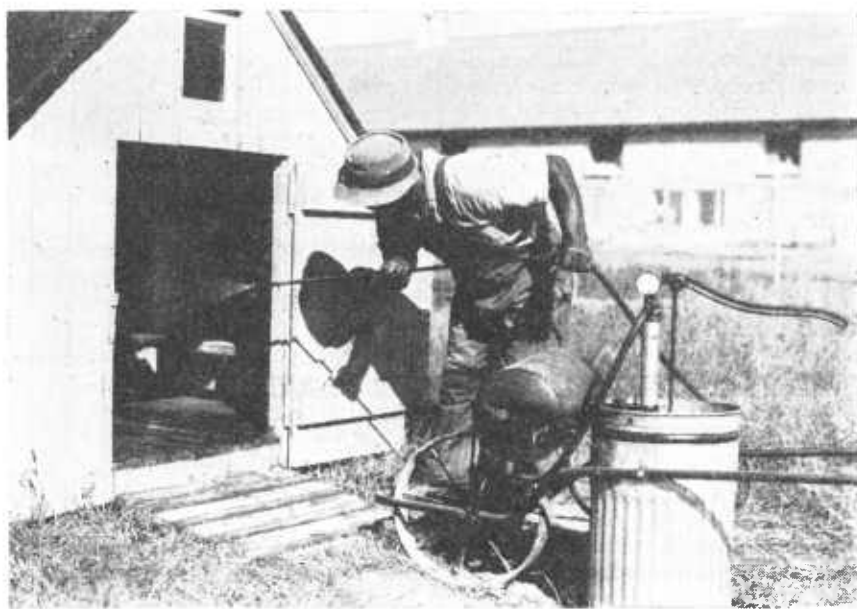
MANAGEMENT OF SOWS DURING PREGNANCY

The result of the year's work with hogs depends more on the management and feeding of the sows during pregnancy than on activities during any other period. If the sows are not in good condition for farrowing, the pigs will not get a good start, and consequently can not make the growth and profit that they should. Suitable feed and ample exercise are the two most important elements of care during pregnancy. Housing, bedding, and watering are also important. The brood sow must keep up her own bodily functions and also develop the litter. To help her do this, she must have a variety of the right kinds of feed. She must be in the best possible condition at farrowing time. Even if she has all the feed she will eat, she will not get too fat. The principal common feeds used for brood sows are corn, shorts or middlings, fishmeal or tankage, soybean meal, linseed meal, bran, alfalfa hay or meal, oats, and barley. Corn is usually the most common and most important feed, and when fed judiciously with the right combination of the other feeds will produce the best results.

For information on feed for sows during pregnancy see page 10.

CARE OF SOWS AND PIGS AT FARROWING

About 3 days before a sow is due to farrow she should be confined to the farrowing pen or house. The pen should be cleaned thoroughly (fig. 9). It should be dry, well-ventilated, about 7 by 7 feet in size, and should be provided with a guard rail made by placing 2- by 4-inch pieces around the inside of the pen about 10 inches from the floor and from 4 to 6 inches from the sides. A guard rail made of piping (fig. 10) is more substantial, as it cannot be chewed.



76023B

FIGURE 9.—Cleaning and disinfecting the farrowing pen before placing the sow in it to farrow.



N6376

FIGURE 10.—A well-bedded farrowing pen.

Remove all bedding, sweep the floor and sides, and wash with scalding water and lye, then rinse with water. When dry, bed the pen with good, clean, dry bedding. Wheat or rye straw, short or chopped hay, and shredded corn fodder are good. Do not use oat straw, as it retains moisture and becomes foul too easily. The quantity of bedding to use should be determined generally by the condition of the weather and by the sow herself. She should be made comfortable. If too little bedding is used, the sow will keep getting up and trying to collect it in a bunch in order to keep herself and the pigs warm.

Before putting the sow into the pen, remove all mud and filth, especially on her udder, by washing with soap and warm water. (Fig. 11.) The sow is likely to become nervous and restless as parturition approaches. She makes a nest for her young. Milk comes down in the teats.

An attendant should always be at hand during farrowing to give any needed assistance. When farrowing occurs during cold weather protect the young pigs by providing a box or basket lined with sacks or other cloth. In the center place some warm bricks or a jug of hot water wrapped in cloth. The receptacle should be lightly covered to hold the heat. As the pigs arrive they should be thoroughly dried, the navel cord tied with a common cotton string about an inch from the belly, and the cord cut just below the tie. It is good practice to treat the raw edges of the wound with tincture of iodine. After this treatment the pigs should be placed in the box or basket until all are farrowed, provided the time is not more than 2 or 3 hours. If farrowing is prolonged, place the pigs to the sow, let them nurse, and return them again to the box or basket.

If any of the pigs appear to be lifeless when born, immediately remove all mucus from the nose, then give them a few gentle slaps on the side with the hand. This may start breathing if there is any life in the body.

A pig is born with eight small tusklike teeth, four in each jaw. These should be cut off before the pigs are placed with the sow to nurse. Care should be taken in cutting these teeth not to injure the jaw or gums. Use sharp, side-cutting pliers, cutting about halfway between the jaw and the point of the tooth. Do not attempt to break or pull them. They are very sharp, and if not cut the pigs may bite the sow's teats when nursing, causing her to jump suddenly, possibly injuring or killing some of the pigs. Another reason is that the pigs may bite or scratch one another, allowing infection to start and causing serious trouble. (Fig. 12.) (See p. 24.)



FIGURE 11.—Washing the sow's sides and udder before she farrows.

Each farrowing pen should have an outside feeding pen or floor, away from the little pigs, where the sow may be fed. This pen should be as wide as the farrowing pen, extending 6 or 8 feet from the building. If the feed is supplied in the farrowing pen, the sow is apt to cripple or kill one or more of the little pigs while eating. On the other hand, if the sow is fed outside, she will deposit her droppings there, preventing the bedding from becoming foul or wet.

SUPPLEMENTAL HEAT FOR PIGS

Over 50 percent of the losses of newborn pigs during the first 10 days of life happen in the first 24 hours. Pigs at birth have a poorly developed heat regulatory mechanism and chill easily. Supplemental heat for pigs at farrowing time has enabled farmers to save many little pigs—up to $1\frac{1}{2}$ more pigs per litter.



78660B

FIGURE 12.—Cutting off the baby teeth before the young pigs nurse will help to prevent injuries.

Where farrowing houses are wired for electricity, supplemental heat may be provided by the use of heat lamps, pig hovers, and farrowing crates.

HEAT LAMPS

Infrared heat lamps are used to furnish heat for both sow and pigs. A 250- or 375-watt bulb, with built-in reflector, suspended over the center of the pen at a height of 42 inches from the floor is out of reach of the sow. Turn one or more heat lamps on over the sow just before she starts to farrow. The heat tends to quiet the sow during parturition and may aid the milk flow. Twelve to twenty-four hours after birth, move the heat lamp to a protected corner of the pen where the pigs are encouraged to nest in safety away from the sow. Heat will be required for from 3 days to 2 weeks, depending on the weather.

Heat lamps come in two types, standard and hard glass. Hard glass lamps are recommended because they are more resistant to breakage due to moisture. Take care to have heat lamps high enough from the floor—36 to 42 inches—to avoid burning the young pigs, and to be out of the sow's reach.

Heat lamps are safe when properly installed. For added safety against fire, have a competent electrician make the installation. He will provide porcelain fixtures, wiring, rubber extension cords, etc., to meet standard fire regulations. He should check the capacity of the circuits, entrance switch, and other conditions to insure efficient use of electricity. Notify your power supplier if more than six lamps are to be operated at one time.

PIG HOVERS

Electric pig hovers are standard equipment in many farrowing houses that have a central heating system. The pig hover (fig. 14)

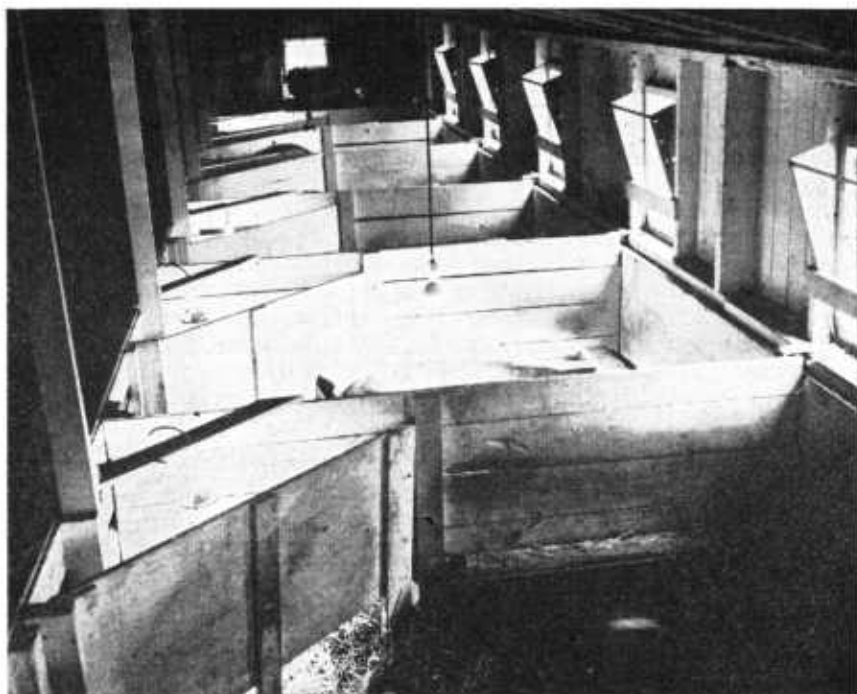
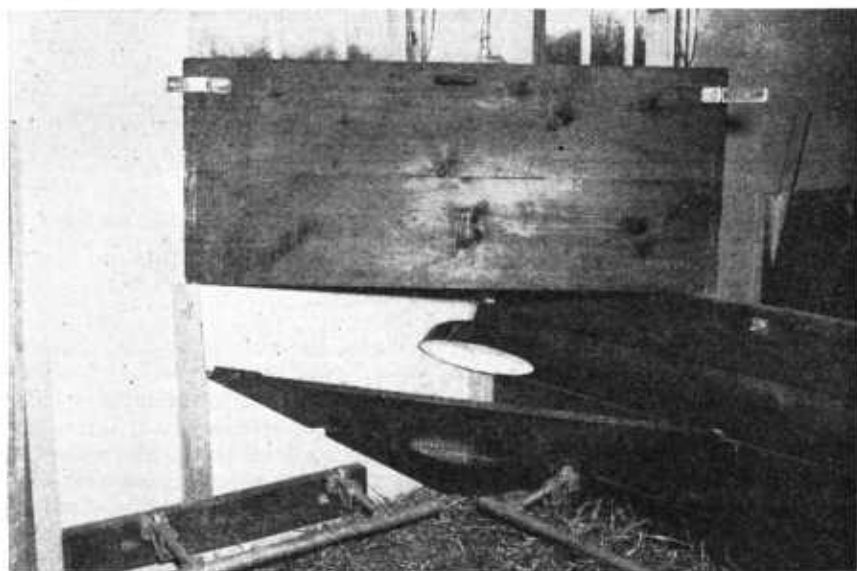


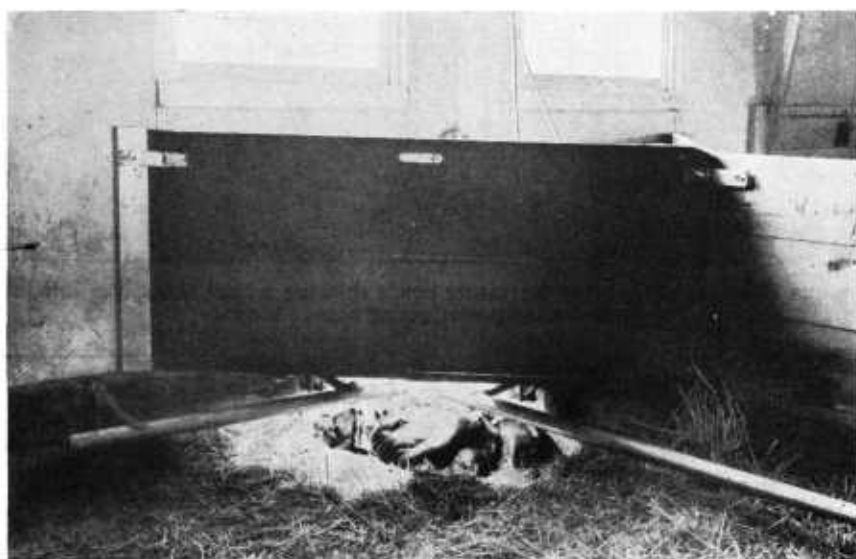
FIGURE 13.—Interior view of farrowing house showing a heat lamp over sow in pen, and a lamp over young pigs in hover.



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FIGURE 14.—The essential parts of an electric pig hover. Baseboard, hurdle, reflector, and incandescent lamp.

is placed in the corner of the farrowing pen. The construction is simple. A hover can be made largely from material usually available on the farm and it is easy to install. The baseboard or cover is fastened into the corner of the pen 12 inches from the floor. A hole 12 inches in diameter is cut through the baseboard. The under side of the hole is covered with hardware cloth to prevent pigs from coming in contact with the light bulb. A light reflector containing a 100- or 150-watt incandescent lamp is placed over the hole. A rubber-covered extension cord from the reflector is plugged into an ordinary weather-proofed socket. A hurdle about 2 feet in height, resting solidly on the outer edge of the baseboard prevents the sow from standing on the base. Boards 1 inch in thickness make a substantial hover. The light and heat attract the young pigs (fig. 15) and lessen the danger that the sow may mash the pigs during the first week, a period when such losses are likely to be heavy if protective devices are lacking.

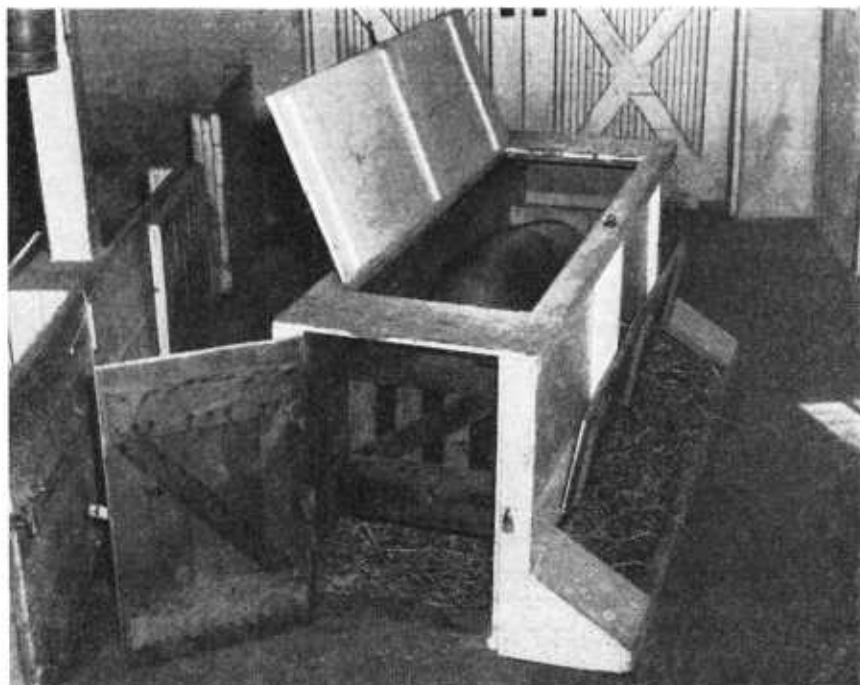


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FIGURE 15.—Pig hover shown in figure 14, assembled, furnishing heat for a newborn litter of pigs.

FARROWING CRATE

The use of a closed-in farrowing crate, in which the sow cannot turn around, is another method of preventing chilling of pigs when farrowing has to be in an unheated barn. The crate includes a feed and water trough at the front. The pigs have an alleyway, 1 foot in width inside the crate between the outer wall of the crate and the inner partition that confines the sow. The heat from the sow's body raises the temperature in the crate 20° to 25° F., above the outside temperatures, so that pigs are kept warm in cold weather. At the end of 3 days the sow and litter are removed from the crate to a pen or outside colony house (fig. 16). Plans for the construction of a farrowing crate may be obtained from the Extension agricultural engineer at many of the State agricultural colleges.



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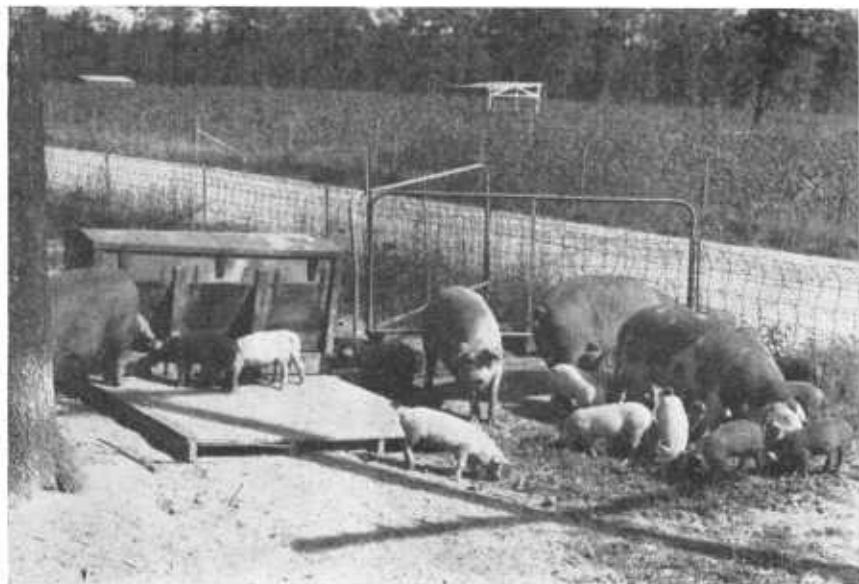
FIGURE 16.—Sow ready to farrow, confined in closed-in farrowing crate.

As a substitute for a farrowing crate some farmers build removable partitions and fasten them in pens of a central farrowing house, or individual colony house. These confine the sow at farrowing time. Heat lamps or incandescent lamps may be used to furnish heat to both sow and pigs at farrowing time. The partitions are easily removed, and take up little storage space. The closed-in farrowing crate has the disadvantage of being heavy and hard to move, and it requires a lot of storage space in the off season when it is not in use.

MANAGEMENT OF SOWS AND SUCKLING PIGS

Several years ago the Bureau of Animal Industry experimented at Beltsville with fall and spring pigs for three successive years to find out the value of self-feeders for sows and suckling pigs. The plan of feeding was as follows: Practically equal numbers of sows and their pigs were placed in two lots. For one lot a self-feeder supplied corn, tankage, middlings, and a simple mineral mixture, each in a separate compartment. Both the sows and the pigs could eat at will at all times (fig. 17). In the other lot, sows and pigs were fed all they would eat twice daily of the same kinds of feeds. In addition a self-feeder was placed in a creep where the little pigs could go at will, undisturbed by the sows (fig. 18). The feeds in the creep were the same as those fed to the sows.

The result was that both the sows and the pigs having access to a self-feeder did better over the 3 years than the hand-fed lots. There was also a saving of feed. Ever since, the self-feeding plan has been followed at Beltsville with satisfactory results.



76015B

FIGURE 17.—The self-feeder is used by both sows and pigs during the suckling period.



78308B

FIGURE 18.—A creep should be so arranged that the pigs may feed undisturbed.

When the sows and pigs are hand-fed during suckling, a creep containing a self-feeder filled with shelled corn should be provided for the pigs when they are about 3 weeks old. The creep should have one or more openings wide and high enough for the pigs to walk in and out freely. Build the sides close to the ground so that they cannot crawl under. If pigs enter the creep by crawling under there is an unnecessary waste of energy, and poor development of the backs of such pigs is likely. Pigs should have free access to a mineral mixture (see p. 28) placed in a small self-feeder at the end of the larger one or supplied in a separate compartment of the grain feeder.

When the pigs are about 5 or 6 weeks old, some protein supplement to the corn should be provided. Shorts or middlings of good quality are suitable. This feed should be fed separately from that in the feeder and should not be mixed with the corn. Tankage, fish meal, or old-process linseed meal may be substituted for shorts or middlings.

ANEMIA IN SUCKLING PIGS

Anemia, as the name implies, is a thin, watery condition of the blood, and is most likely to occur in young pigs confined without access to soil. The condition is primarily due to a deficiency of iron and copper in the sow's milk and in supplementary feed. Pigs that develop anemia become sluggish and show lack of vigor, a paleness of the mucous membranes, and a rough, dull appearance of the hair. As the disease progresses, the pigs become weak and thin and may develop scours or thumps.

The placing of clean, fresh soil or sod on the floor of the pen to which pigs have access has usually proved beneficial. In sections where there is an iron deficiency, this treatment is more effective if the soil is fortified with 10 grams of ferrous sulfate and 1.5 grams of copper sulfate to each 50 pounds of soil. Dissolve the iron and copper salts in a pint of hot water and sprinkle the solution over the soil, mixing it with the soil thoroughly. Swabbing the sow's udder once a day with a saturated ferrous sulfate solution until the pigs are 6 weeks old is an effective method of preventing anemia. In bad cases of the disease individual medication may be necessary. For pigs 3 weeks old a teaspoonful of the solution recommended for sprinkling on the soil, given as a drench once a day, furnishes enough of the minerals to correct the deficiency quickly.

CASTRATION

Pigs should be castrated while still suckling their dams—early enough to allow plenty of time for the wounds to heal thoroughly before weaning. For detailed information consult Farmers' Bulletin 1357, *Castration of Hogs*.

WEANING THE PIGS

Hog raisers differ widely in their opinions on the age at which pigs should be weaned. Pigs are weaned at all ages from 5 to 12 weeks, or even older. The mother's milk is the natural and best food for a pig and should be used fully. A good brood sow, well-fed and handled, will furnish a good flow of milk until the pigs are from 10 to 12 weeks old. A sow that will not do this should be discarded.

Without some special reason, pigs should not be weaned until they are at least 8 weeks old. Some breeders wean them earlier to get two litters a year. In general this is not necessary. It is better to raise three litters in 2 years. A pig stunted by early weaning or from any other cause will never be so profitable as it would have been without this setback.

When pigs are self-fed while suckling, it is advisable to fence the sows away from the self-feeders 3 or 4 days before the sows are to be taken away, leaving openings large enough to let the pigs feed whenever they wish. Shutting off the feed from the sow reduces her milk flow and the pigs soon learn to depend entirely on the feeders.

If the sows are hand-fed during suckling, weaning should begin by reducing the richness and quantity of the sow's feed 4 or 5 days before weaning. This will tend to reduce the milk flow. Then remove the sow, leaving the pigs in the quarters they occupied while suckling, with access to the self-feeder.

If the sow is handled thus it will seldom be necessary to milk her to prevent a caked udder. If the udder becomes too full, return the sow to the pigs to suckle and remove her as soon as they have finished. It is rarely necessary to return an underfed sow to the pigs more than once.

After the pigs are weaned, keep them on good pasture with access to the self-feeder containing corn, a protein feed, and mineral mixture. If at any time while the pigs are suckling or after they are weaned skim milk or buttermilk is added to the ration, commence feeding the added feed in small quantities, gradually increasing the amount fed daily.

TWO LITTERS A YEAR

The question of raising one or two litters a year is one to which there is no sure-fire answer. Much depends on where the hog grower is located, his equipment for handling pigs during the winter, how the scheme fits into his farming operations, and other local conditions. Fall pigs require a great deal of attention, and few farmers are in position to care for as many fall pigs as spring pigs. The age at which pigs are weaned has much to do with raising two litters a year. Best profits usually result if pigs nurse for at least 8 weeks.

In the northern half of the United States fall pigs should not be farrowed after October 15. If farrowed later they will not have time to make a good start before cold weather. Throughout the country a large percentage of the spring pigs are farrowed in March and April and fall pigs in September and October. If a sow farrows March 15 and the pigs suckle 10 weeks, they will be weaned May 24. If the sow is in good condition, she will come "in season" three or four days after the pigs are weaned and may be rebred immediately. If she is rebred May 28, she will farrow September 17. These pigs would be weaned November 26, which would allow rebreeding for farrowing March 20. It is not always possible to get a sow settled at the first service and this uncertainty makes it difficult to assure farrowing on time. Therefore, two litters a year from all the sows in the herd is practically impossible.

If the pigs are allowed to suckle 8 weeks, as they should be, it is easily possible for a good sow to raise three litters in 2 years. This is a good average and would probably meet the needs of most farmers. Also it would be likely to show the best net profits in the long run.

FALL PIGS

Pigs farrowed in the fall require more attention than spring-farrowed pigs. This applies more particularly to the northern part of the country than to the South. During the winter in all parts of the country fall pigs should have easy access to comfortable, dry, well-bedded quarters. In the North, where snows are frequent, pigs running in and out naturally carry in more or less moisture that dampens the bedding. Pigs should never be allowed to sleep on damp bedding and it must be watched closely and changed often.

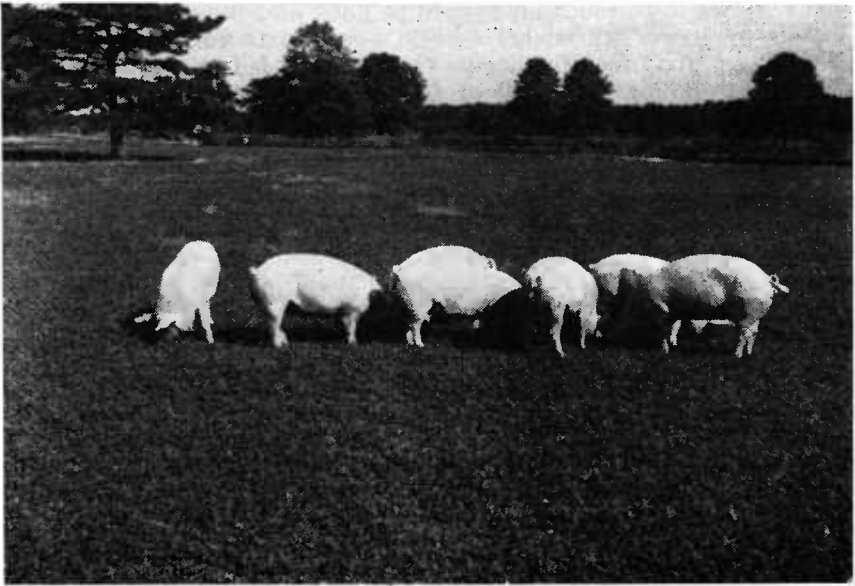
Pigs always need a constant supply of water. In cold regions open-trough watering is inefficient. Automatically heated water should be provided.

In the southern part of the country winter pasture of some kind can usually be provided. Fall pigs, as well as other hogs, should have access to winter pasture when available.

SELECTING PIGS FOR BREEDING

Every hog grower should look his pig crop over each year and try to select a few gilts to improve the breeding herd. Sometimes an outstanding animal may be selected soon after weaning, but as a rule it is best to wait until the pigs are from 5 to 6 months of age. By that time they are so nearly grown that faults can be detected. A good, tried, brood sow should not be replaced by a gilt unless the change is reasonably sure to make an improvement in the quality of the herd. (Fig. 19.)

If possible, gilts selected for the breeding herd should be placed in a good pasture by themselves. They should not be fed too heavily



12892A

FIGURE 19.—Gilts from 5 to 6 months old show desirable qualities which indicate their probable value as breeding animals.

but should have a liberal ration. Feed corn only in limited quantities—from one-fourth to one-third of the total feed. Shorts or middlings with a little tankage or fish meal added, fed either dry or in a thick slop, can constitute, with pasture, a very satisfactory ration. Mineral mixture, salt, and water should always be kept before them. If any selected gilt does not develop satisfactorily she should be discarded from the herd and fattened for market.

THE PUREBRED HOG BUSINESS

A beginner in the hog-raising business should get purebred animals for his foundation stock, but he should confine his efforts to the raising of market hogs for a few years, or until experience teaches him how to mate animals for good results and how to feed them for profit. Purebred hogs may be expected to make more rapid growth than those of inferior breeding. After he has learned how to grow and feed hogs for the market he may decide to go into the business of growing purebreds and have good prospects of success.

The method of handling hogs to be used for breeding purposes is somewhat different from that of fattening them for market. Breeding hogs must be fed with the purpose in mind of growing a good frame that will support the body for several years rather than one whose usefulness ends at the age of 5 or 6 months. Doing this calls for a higher percentage of protein and mineral feeds in the ration.

Breeding hogs should also have the run of a good pasture during the pasture season. The kind of pasture is less important than the fact that the hogs are on pasture. They should have corn, possibly about one-fourth of the ration, the remainder to be made up of shorts or middlings, a little fish meal or tankage and pasture. If available, skim milk or buttermilk is recommended.

If oats are to be fed, they should be good and plump, weighing 32 pounds or more per bushel. Lightweight oats contain too much fiber to be a good feed for hogs. Oats may be fed in a self-feeder or scattered thin on a feeding floor, but should never be fed by pouring them in piles or in a trough. Too many breeders of purebred hogs buy more than they need of high-priced concentrates and mixed feeds, when feeds they are growing on their own farms would produce just as good animals at much less cost.

The practice of keeping a registered herd of purebred hogs and selling the offspring for breeding is a branch of the hog business that may be carried on at a profit, but often nets losses. The successful breeder of purebreds must know both feeding and breeding methods and in addition be a good salesman.

KEEPING RECORDS

Every grower needs a book record of his system of marking the pigs of each litter. If his herd is one from which pedigreed stock for breeding purposes is sold, some system of marking must be followed. The most satisfactory method is to notch the ears. Every pig should be marked at farrowing time. Ear tags of different kinds are used, but they often tear out and the identity of the pig is lost.

Even if hogs are raised for market only, earmarking the pigs is of great assistance in making selections for the breeding herd. Reliable selection can be made only if the dam of the pig is known

and her record of performance examined. Every breeding date should be recorded so that the herdsman will know the farrowing dates and be ready to feed and care for the sow. Unless the individual animals in the herd are earmarked such records are impossible.

The system indicated in figure 20 should prove satisfactory.

Small, sharp, side-cutting pliers do a good job of ear notching. For permanent marks of identification, notch deeply enough to include a part of the cartilage of the ear as well as the skin. Notch the ears soon after the litter is farrowed, when the wounds heal quickly.

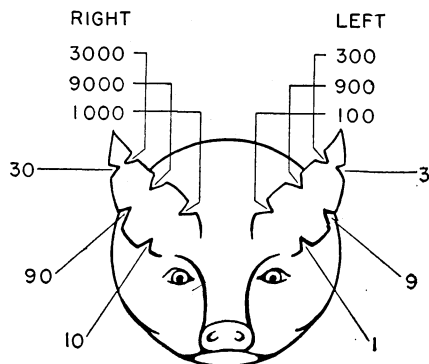


FIGURE 20.—Method of earmarking pigs.

SELLING BREEDING STOCK

The first essential in selling breeding stock is to cull the herd closely and offer only animals of merit. The percentage of hogs in the herd that should be culled and fattened for market varies widely. Much depends on the quality of individual animals in the breeding herd and the herdsman's ability to make the best of them by good feeding and wise mating. A herd would be above the average in quality if 50 percent of the animals proved desirable for breeders. Market the remainder.

Two general systems are followed in disposing of surplus stock: public and private sale. The public-sale system is common and has many advantages. All the stock is sold at auction in one day, and the buyer sees what he is buying and names his own price. Among the disadvantages of the public sale are the time and expense in making arrangements, constructing the sale ring, providing the lunch, and the possibility of bad weather, which may make a considerable difference in the prices obtained. The private-sale system calls for a different plan of advertising and requires also considerable correspondence, in which the seller must be very careful in describing his animals. He should be careful never to overestimate the quality or value of the animals. A common mistake made by breeders of purebred stock is that they do not cultivate the trade of neighboring farmers. They spend too much time and money in trying to interest distant purchasers.

SANITATION

Results from the very best methods of feeding and breeding will be lessened by faulty sanitation. Hog cholera causes the greatest losses.

Hog "flu" and external and internal parasites also cause losses. Insanitary hog lots and buildings may not produce diseases caused by specific germs or viruses but lack of sanitation may have a permanently bad effect on the vitality of the animal. Naturally the animal with the greatest vitality will be in better condition to resist the attack of any disease than will the one low in vitality; hence insanitary conditions in the hog lot may have much to do with losses from communicable diseases.

Keep farrowing houses and sleeping quarters thoroughly clean. Change the bedding frequently; do not let it become wet and foul. The floors of the sleeping quarters may also become dusty. Dust is irritating to the lungs and may also carry eggs of parasites. For this reason floors should be thoroughly cleaned, swept at least every 2 or 3 weeks, and disinfected with a 3-percent solution of compound cresol (U. S. P.).

Pens and feeding places that are not plowed should have frequent applications of air-slaked lime, which will aid in the drying of damp places and assist in disinfection. All barnyards and lots on which hogs are kept for any length of time should be plowed at least twice a year as a disinfection aid. Temporary pasture crops can be planted in these lots, thereby making the plowing profitable in two ways.

The swine sanitation system was developed by the Bureau of Animal Industry to control parasites of swine (p. 38). If the sows have been running on pasture and are not encrusted with mud or filth, the farrowing may be done on a clean pasture to which the sows are transferred directly. This modification is applicable to fall farrowing in practically all States and is suitable for both spring and fall farrowing in the South.

SHADE

Hogs suffer greatly from heat and must have shade. Trees supply good shade if there are enough in a clump. Neither the ordinary farrowing house with a low ceiling, commonly used in the North, nor the box-type or A-shaped individual house supplies suitable shade. Hogs will seek shade even though they suffocate. Such structures do not have sufficient air space or good circulation. They should be kept closed in hot weather to prevent hogs from lying in them.

A satisfactory shading structure consists of a framework about 4 feet high, made of posts, poles, or almost any available material, and having the top covered with hay, straw, or weeds to a depth of at least 2 feet. When dust accumulates under the shelter, wetting the covering so that the water drips through will both lay the dust and cool the air under the roof. (Fig. 21.)

HOG WALLOWS

A hog wallow made of concrete and located in a convenient shady place is a benefit in a hog yard, but a mud wallow made by the hogs rooting a hole in the lot or pasture is a nuisance and should be filled in. It is impossible to keep a mud wallow in anything like sanitary condition. The hogs will often drink of the water that has become stagnant and foul, and therefore a source of danger. The concrete wallow should hold from 4 to 6 inches of water and should be cleaned frequently and refilled with fresh water. Enough crude oil to form a thin layer on the water should be poured into the wallow about every 10 days to control lice.



78115B

FIGURE 21.—This type of construction, with bales of straw for walls, furnishes shelter in winter. The straw walls removed, the shelter provides shade in summer.

DISEASES

Among the important diseases of hogs are hog cholera, erysipelas, brucellosis, tuberculosis, necrotic enteritis, and parasitic affections. Hog “flu” or swine influenza is now recognized as a distinct infection. Its symptoms are loss of appetite, violent coughing, occasional vomiting, and rise of temperature. The only known treatment consists in placing the hogs in warm dry quarters, allowing them as complete rest as possible, and giving them a constant supply of fresh drinking water.

Post mortem examinations of the carcasses of animals that die on the farm are rare; consequently the cause of death is not identified. Because some other farm animals and poultry have diseases that can be transmitted to hogs, the danger of permitting hogs to eat the carcasses outweighs the feeding value of the carcass. Such carcasses should be burned or buried.

HOG CHOLERA

Of all the diseases from which hogs suffer, hog cholera causes the greatest loss. It is an infectious disease, and the herd is safe from possible attack only when immunized against the disease. Hogs may be immunized by means of serum and virus or the more recently developed vaccines.

During the period 1921–30 the United States Department of Agriculture immunized by the serum and virus treatment more than 9,000 suckling pigs ranging from 1 day to 12 weeks in age. It was found that age is not a factor in successful immunization by that treatment. There were distinct advantages in immunizing pigs early. When the pigs are weaned, fattening them for market can be begun immediately without losing time in reducing the feed because of immunization;

less time is needed to immunize pigs; there is less danger of complications with other diseases; and the period during which they are susceptible to hog cholera is shorter. However, age may be a factor when using vaccines, because pigs farrowed by sows that have had the serum-virus treatment may fail to develop satisfactory immunity if vaccinated while suckling.

If a suspicious ailment occurs, consult a reliable veterinarian. If the diagnosis is hog cholera all the uninfected hogs should be removed to clean disinfected quarters and all the animals in the herd should be immunized as quickly as possible. If any of the animals die, the carcasses should be burned to ashes or buried 4 feet under ground and covered with quicklime. Farmers' Bulletin 834 discusses the subject of hog cholera fully.

SWINE ERYSIPELAS

Swine erysipelas is a disease principally affecting swine, and ranks second to hog cholera in importance in this country. Sheep, as well as turkeys, are also affected by the causative organism of this disease, and from the standpoint of human health the handling of infected meat is the more common source of the infection in man.

Swine erysipelas is most common in the Corn Belt, but it has been a troublesome problem wherever many swine are raised. Swine of all ages are affected, though the incidence of the disease is found to be greater in swine over 3 months of age. This disease also appears to be influenced by the season, with the most erysipelas during July, August, and September, and the least in January, February, and March.

The establishment of a diagnosis of this disease requires the study of the herd history, of the symptoms, and also the services of a laboratory. Hyperimmune serum with or without penicillin has been used to advantage in early treatment of sick animals. Vaccination using serum and live culture of the organism has been a satisfactory aid in controlling the disease but its use is confined to those States having a memorandum of agreement with the Federal Government. In early 1952 there were 24 States cooperating in this control project. Prevention and control of this disease can be assisted greatly by the swine owner using sound husbandry practices and the services of a veterinarian. Additional information on swine erysipelas can be found in Farmers' Bulletin 1914, Diseases of Swine.

BRUCELLOSIS

Brucellosis of swine is an infectious disease usually caused by the organism, *Brucella suis*. The disease is capable of causing considerable financial losses to swine raisers and is transmissible to man.

The symptoms of the disease vary considerably in different herds and may be characterized by abortions, birth of stillborn or weak pigs, temporary or permanent sterility, posterior paralysis, and lameness. Enlargement of one or both testicles is often observed in boars.

Swine brucellosis is diagnosed by isolation of the infective organism and the blood serum agglutination test. The agglutination test has been used more successfully in diagnosing the infection in a herd than in the individual animal because some infected individuals fail to show a titer or have a very low titer.

Good sanitation and herd management are important in the prevention and control of swine brucellosis. Replacement stock should be

obtained from a *Brucella*-free source. If this is impossible, all replacements should be held in quarantine and have two negative tests 60 days apart before being added to the herd. The two methods that have proved to be the most successful in eliminating infection from a herd are (1) disposal of the entire herd and replacement with swine from herds free of infection, or (2) disposal of infected breeding animals and replacement with noninfected offspring. Limited control programs are in effect in several States, and many States require a negative blood agglutination test on all swine before entrance is permitted. The subject is discussed in detail in Circular No. 781, *Brucellosis of Swine*.

TUBERCULOSIS

Considerable tuberculosis exists among hogs in the United States, particularly in the Middle West. The degree of infection in a carcass determines whether it must be condemned wholly or only partly.

The source of this disease in hogs is very largely tuberculous fowls. However, there are still some tuberculous cattle in the United States that spread this disease to swine. The disease is most frequently spread to swine by their eating fowls affected with generalized tuberculosis or by having the feed or water contaminated with excretions carrying the tubercle bacilli. Where tuberculosis still remains in dairy herds, hogs may become infected by drinking unsterilized milk or dairy products or by eating grain that has passed undigested through tuberculous cattle. Milk from herds which are shown by the tuberculin test not to be free from tuberculosis should be made safe by being sterilized or cooked before it is fed. To destroy disease germs it is necessary to subject the substance containing them to the boiling temperature long enough for the interior of the mass to reach that temperature or else to hold it at a temperature of 140° F. for at least an hour. In some cases tuberculosis is probably transmitted from one hog to another. Tuberculous hogs can rarely be detected by their appearance, the only reliable means of detection are the tuberculin test or slaughter. If hogs sold for slaughter are found to be tuberculous, it is best to fatten and sell all those remaining in the herd if they are grades. If they are valuable purebreds, a competent veterinarian may be able, by means of the tuberculin test, to identify the diseased animals. All reactors to the test should be slaughtered and inspected. Those failing to react may be retained for breeding purposes but should be subjected to a retest in from 60 days to 6 months.

NECROTIC ENTERITIS

The term necrotic enteritis, commonly called "Necro," means an inflammation of the intestines. At one time this condition was considered a specific disease, but further research has shown at least three diseases in which lesions of necrotic enteritis occur. Lesions characteristic of Necro may occur in infections with an organism known as *Salmonella choleraesuis*. Similar symptoms may occur in pigs on diets deficient in some of the B vitamins. Hogs with cholera sometimes develop symptoms that may be mistaken for necrotic enteritis.

Further details of these diseases are given in *Farmers' Bulletin* 834, *Hog Cholera*, but their differentiation is difficult and requires the services of an experienced veterinarian.

PARASITES

Hogs of all ages may be affected by external and internal parasites that may cause death, particularly among small pigs. Indirect losses resulting from reduced vitality are frequent. Parasitism prevents the best and most rapid development. The most damaging internal parasites are large roundworms, kidney worms, thorn-headed worms, lungworms, and intestinal threadworms. The principal external parasites affecting hogs are sarcoptic mange mites and sucking lice. Most of these and some other species are found in practically all hog-raising areas.

INTERNAL PARASITES

Chief reliance for protection from internal parasites must be placed on sanitary rearing, special dietary management, and judicious medication with effective remedies. Most swine parasites can be controlled by a system of sanitation which includes the following main features: (1) Clean, disinfected farrowing pens; (2) sows washed clean before farrowing; (3) a "clean" trip to clean pastures for sows and their litters; and (4) clean pastures for the pigs until they are at least 4 months old.

Most internal parasites can also be controlled by feeding pigs exclusively on milk, skimmed milk, or whey for periods of three successive days at intervals of 2 weeks, or by feeding one or another of these daily in lieu of one grain feeding. Medication is exceptionally efficacious for the control of large roundworms, and the use of an efficient treatment against them is almost always a necessary part of successful hog raising. The most effective treatment consists in the administration of sodium fluoride (technical grade, tinted) at a concentration of 1 percent by weight of dry, ground feed for a period of 1 day. Pigs should be slightly underfed the day before treatment, but should not be fasted. On the day of treatment, they should be given about two-thirds as much medicated feed as they normally consume of regular feed. Market pigs should be treated at weaning and again about 2 months later. Ordinarily, no other treatments are necessary or advisable. The treatment should not be given to pregnant or lactating sows, or to any animals showing symptoms of gastroenteritis.

Sodium fluoride is poisonous, and containers should be conspicuously labeled and stored out of reach of children.

EXTERNAL PARASITES

For the treatment of mange and the eradication of lice, many chemicals are safe and effective. Thorough spraying with 0.12 percent gamma benzene hexachloride (using commercial wettable BHC) or lindane is effective against both lice and mites in one application, Chloradane, at 0.25 percent, is equally effective. Toxaphene, TDE, and methoxychlor, at 0.4 to 0.5 percent concentrations appear also to give excellent results. Both parasites are also very susceptible to the action of crude petroleum, used as a dip. Market hogs should not be treated within 3 to 4 weeks of slaughter, particularly if technical benzene hexachloride is applied to them.

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